1 Cover Page

RF Exposure Evaluation Report

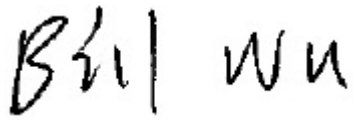
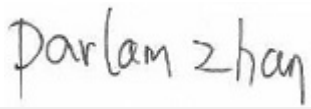
Application No.:	SHEM2108008609CR
FCC ID:	2AZSCEC-3816S
Applicant:	DeepBlue Technology (Shanghai) Co.,Ltd
Address of Applicant:	9 / F, binggu building, Weining Road, Changning District, Shanghai,China
Manufacturer:	DeepBlue Technology (Shanghai) Co.,Ltd
Address of Manufacturer:	9 / F, binggu building, Weining Road, Changning District, Shanghai,China
Equipment Under Test (EUT):	
EUT Name:	Wireless Module
Model No.:	EC-3816S
Trade mark:	LG
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06
Date of Receipt:	2021-08-03
Date of Test:	2021-08-21 to 2021-09-06
Date of Issue:	2021-09-11
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan
Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in writing.

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2021-09-11	/

Authorized for issue by:				
				
		Bill Wu / Project Engineer		
				
		Parlam Zhan / Reviewer		

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. Testing Center EMC Laboratory
NO.588 West Jindu Road,Songjiang District,Shanghai,China 201612
中国・上海・松江区金都西路588号 邮编: 201612
t(86-21) 61915666 f(86-21)61915678 www.sgsgroup.com.cn
t(86-21) 61915666 f(86-21)61915678 e sgs.china@sgs.com

2 Contents

3 General Information

3.1 General Description of E.U.T.

Power supply:	DC 3.3V

3.2 Details of E.U.T.

BT:

Antenna Gain:	3dBi (Provided by manufacturer)
Antenna Type:	PIFA Antenna
Bluetooth Version:	V4.2 Dual mode
Channel Spacing:	1MHz
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)

BLE:

Antenna Gain:	3dBi (Provided by manufacturer)
Antenna Type:	PIFA Antenna
Bluetooth Version:	V4.2 Dual mode
Data Rate:	1Mbps
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz

2.4G WiFi:

Antenna Gain:	Antenna1: 3dBi (Provided by manufacturer) Antenna2: 3dBi (Provided by manufacturer) Directional gain: 6dBi
Antenna Type:	Antenna1: PIFA Antenna Antenna2: PIFA Antenna
Channel Spacing:	5MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11 802.11n(HT40):7
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz
Date Rate:	802.11b:1/2/5.5./11Mbps 802.11g:6/9/12/18/24/36/48/54Mbps

	802.11n:MCS0-MCS7

5G WiFi

Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	UNII Band II-A	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
		802.11ac(HT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(HT20)	5500-5700	11
		802.11n(HT40)/ac(HT40)	5510-5670	5
		802.11ac(HT80)	5530~5610	2
	UNII Band III	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	5775	1
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Date Rate:	802.11a:6/9/12/18/24/36/48/54Mbps 802.11n:MCS0-MCS7 802.11ac:VHT MCS0-MCS7			
Channel Spacing:	802.11a/n(HT20)/ac(HT20): 20MHz 802.11n(HT40)/ac(HT40): 40MHz 802.11ac(HT80): 80MHz			
Antenna Gain:	Antenna1: 3dBi (Provided by manufacturer) Antenna2: 3dBi (Provided by manufacturer) Directional gain: 6dBi			
Antenna Type:	Antenna1: PIFA Antenna Antenna2: PIFA Antenna			
TPC Function:	Not support			
DFS Function:	Slaver without radar detection			

3.3 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L4354)

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 2541.01)

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC (Designation Number: CN1172)

Compliance Certification Services Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED (CAB Identifier: CN0072)

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development (ISED) Canada as an accredited testing laboratory.

CAB Identifier: CN0072.

• VCCI (Member No.: 1938)

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600,C-11707, T-11499, G-10216 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to§1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm^2)	Averaging time(minutes)
300MHz~1.5GHz	f/1500	30
1.5GHz~100GHz	1.0	30

5 Measurement and Calculation

5.1 Maximum transmit power

For BT Classic mode

Test mode	Channel	Peak Power (dBm)	Peak Power (mW)
GFSK	2402	6.13	4.10
	2441	6.28	4.25
	2480	6.25	4.22
π/4DQPSK	2402	7.44	5.55
	2441	7.79	**6.01**
	2480	7.49	5.61
8DPSK	2402	6.73	4.71
	2441	7.14	5.18
	2480	7.01	5.02

For BLE mode

Test mode	Channel	Peak Power (dBm)	Peak Power (mW)
GFSK	2402	5.04	3.19
	2440	5.22	3.33
	2480	5.45	3.51

For 2.4G WiFi

Test mode	Test Frequency (MHz)	Average Power (dBm)			Average Power (mW)		
		Ant 1	Ant 2	MIMO	Ant 1	Ant 2	MIMO
802.11b	2412	16.91	16.83	/	49.09	48.19	/
	2437	17.92	17.41	/	61.94	55.08	/
	2462	17.05	17.20	/	50.70	52.48	/
802.11g	2412	16.19	17.14	/	41.59	51.76	/
	2437	18.04	18.25	/	63.68	66.83	/
	2462	17.02	17.64	/	50.35	58.08	/
802.11 n(HT20)	2412	14.32	14.51	17.43	27.04	28.25	55.34
	2437	13.87	14.39	17.15	24.38	27.48	51.88
	2462	15.05	15.21	18.14	31.99	33.19	65.16
802.11 n(HT40)	2422	13.95	14.10	17.04	24.83	25.70	50.58
	2437	14.94	15.20	18.08	31.19	33.11	64.27
	2452	21.02	15.03	22.00	126.47	31.84	**158.49**

For 5G WiFi

Test Mode	Frequency (MHz)	Measured Output Power (dBm)			Measured Output Power (mW)		
		Ant 1	Ant 2	MIMO	Ant 1	Ant 2	MIMO
802.11a	5180	16.25	16.99	/	42.17	50.00	/
	5200	16.64	17.39	/	46.13	54.83	/
	5240	17.14	17.53	/	51.76	56.62	/
	5260	17.10	17.53	/	51.29	56.62	/
	5300	17.43	17.25	/	55.34	53.09	/
	5320	16.90	16.66	/	48.98	46.34	/
	5500	17.36	17.09	/	54.45	51.17	/
	5580	17.45	17.39	/	55.59	54.83	/
	5600	16.98	17.32	/	49.89	53.95	/
	5700	17.73	17.61	/	59.29	57.68	/
	5745	17.34	17.46	/	54.20	55.72	/
	5785	17.35	17.14	/	54.33	51.76	/
	5825	17.20	17.10	/	52.48	51.29	/
802.11n(HT20)	5180	14.18	14.74	17.48	26.18	29.79	55.98
	5200	13.85	14.72	17.32	24.27	29.65	53.95
	5240	14.50	14.74	17.63	28.18	29.79	57.94
	5260	14.45	14.67	17.57	27.86	29.31	57.15
	5300	14.71	14.33	17.53	29.58	27.10	56.62
	5320	14.66	14.34	17.51	29.24	27.16	56.36
	5500	14.23	14.04	17.15	26.49	25.35	51.88
	5580	14.45	14.44	17.46	27.86	27.80	55.72
	5600	14.45	14.24	17.36	27.86	26.55	54.45
	5700	14.68	14.65	17.68	29.38	29.17	58.61
	5745	14.73	14.80	17.78	29.72	30.20	59.98
	5785	14.71	14.60	17.67	29.58	28.84	58.48
	5825	14.72	14.43	17.59	29.65	27.73	57.41
802.11n(HT40)	5190	13.37	13.95	16.68	21.73	24.83	46.56
	5230	14.40	14.46	17.44	27.54	27.93	55.46
	5270	14.38	14.39	17.40	27.42	27.48	54.95
	5310	14.25	14.10	17.19	26.61	25.70	52.36
	5510	14.59	14.10	17.36	28.77	25.70	54.45
	5550	14.33	14.05	17.20	27.10	25.41	52.48
	5590	14.43	14.24	17.35	27.73	26.55	54.33
	5670	14.58	14.36	17.48	28.71	27.29	55.98
	5755	14.00	13.91	16.97	25.12	24.60	49.77
	5795	14.30	13.93	17.13	26.92	24.72	51.64
802.11ac(VHT20)	5180	14.58	13.64	17.15	28.71	23.12	51.88
	5200	13.85	14.60	17.25	24.27	28.84	53.09
	5240	14.69	14.81	17.76	29.44	30.27	59.70
	5260	14.54	14.93	17.75	28.44	31.12	59.57
	5300	14.53	14.33	17.44	28.38	27.10	55.46
	5320	13.88	13.78	16.84	24.43	23.88	48.31
	5500	14.91	14.68	17.81	30.97	29.38	60.39
	5580	14.61	14.63	17.63	28.91	29.04	57.94
	5600	14.47	14.45	17.47	27.99	27.86	55.85
	5700	14.95	14.70	17.84	31.26	29.51	60.81
	5745	14.46	14.82	17.65	27.93	30.34	58.21
	5785	14.20	14.47	17.35	26.30	27.99	54.33
	5825	14.52	14.68	17.61	28.31	29.38	57.68
802.11ac(VHT40)	5190	13.33	14.22	16.81	21.53	26.42	47.97

NO.588 West Jindu Road,Songjiang District,Shanghai,China 201612 t(86-21)61915666 f(86-21)61915678 www.sgsgroup.com.cn
中国・上海・松江区金都西路588号 邮编: 201612 t(86-21)61915666 f(86-21)61915678 e sgs.china@sgs.com

	5230	13.96	14.42	17.21	24.89	27.67	52.60
	5270	14.33	14.60	17.48	27.10	28.84	55.98
	5310	14.37	14.33	17.36	27.35	27.10	54.45
	5510	14.62	14.30	17.47	28.97	26.92	55.85
	5550	14.52	14.41	17.48	28.31	27.61	55.98
	5590	14.58	14.48	17.54	28.71	28.05	56.75
	5670	15.05	14.77	17.92	31.99	29.99	61.94
	5755	15.04	15.19	18.13	31.92	33.04	65.01
	5795	15.34	15.15	18.26	34.20	32.73	**66.99**
802.11ac(VHT80)	5210	14.45	14.95	17.72	27.86	31.26	59.16
	5290	15.08	14.98	18.04	32.21	31.48	63.68
	5530	14.52	14.06	17.31	28.31	25.47	53.83
	5610	14.63	14.61	17.63	29.04	28.91	57.94
	5775	14.57	14.88	17.74	28.64	30.76	59.43

5.2 MPE Calculation

According to the formula $S=P/4\pi R^2$, we can calculate S which is MPE.

Note:

1) P (mW)

2) R = distance to the center of radiation of antenna (in meter) = 20cm

3) MPE limit = 1mW/cm²

For BT

The max. antenna gain is 3 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
6.01	1.995	20	0.00239	1	Pass

For 2.4G WiFi

The max. antenna gain is 6 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
158.49	3.981	20	0.12553	1	Pass

For 5G WiFi

The max. antenna gain is 6 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
66.99	3.981	20	0.05306	1	Pass

The BT and the WiFi modules can simultaneous transmitting.But the maximum rate of MPE is 0.002/1.0+0.126/1.0=0.128<=1.0. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

--End of the Report--

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
Testing Center EMC Laboratory
NO.588 West Jindu Road,Songjiang District,Shanghai,China 201612
中国・上海・松江区金都西路588号 邮编: 201612
t(86-21)61915666 f(86-21)61915678 www.sgsgroup.com.cn
t(86-21)61915666 f(86-21)61915678 e sgs.china@sgs.com